

## CLAIMS

What is claimed is:

- 1 1. A method of modifying data in a database system, the method comprising the steps  
2 of:  
3     constructing work granules that manipulate rows in a manner that groups the rows  
4         within said work granules according to logical storage units that contain the  
5         rows; and  
6         during execution by an entity of a particular work granule that involves manipulation  
7             operations for rows in a particular logical storage unit:  
8                 causing said entity to perform said manipulation operations for rows  
9                     completely contained in said logical storage unit;  
10                 determining a set of spanning rows that are partially contained in said logical  
11                     storage unit and that satisfy a particular condition; and  
12                 causing said entity to perform said manipulation operations for all pieces of all  
13                     spanning rows in said set of spanning rows.

- 1 2. The method of Claim 1, wherein said particular condition is that each spanning row in  
2 said set start in said logical storage unit.

- 1 3. The method of Claim 1, wherein:  
2     said work granules include:  
3         a first work granule that involves manipulation operations for a first logical  
4             storage unit that includes a portion of a row, and  
5         a second work granule that involves manipulation operations for a second  
6             logical storage unit that also includes another portion of said row;  
7     the method further includes:

during execution of said first work granule,

determining that said row satisfies said particular condition, and

in response to determining that said row satisfies said particular

condition, performing a manipulation operation for said row;

and

during execution of said second work granule,

determining that said row does not satisfy said particular condition,

and

in response to determining that said row does not satisfy said particular

condition, foregoing any manipulation operation for said row.

4. The method of Claim 1, wherein said work granules are executed as part of a transaction that includes a first subtransaction and a second subtransaction, wherein a first work granule is executed as part of said first subtransaction and a second work granule is executed as part of said second subtransaction.

5. The method of Claim 4, wherein  
said first work granule involves manipulation operations for a first logical storage unit  
that includes a portion of a row;  
said second work granule involves manipulation operations for a second logical  
storage unit that also includes another portion of said row; and  
the method further includes executing a manipulation operation for said row as part of  
said first subtransaction.

- 1       6. The method of Claim 5, wherein said first logical storage unit contains a first  
2                   transaction list with a first entry, wherein said second logical storage unit contains a  
3                   second transaction list with a second entry, wherein said step of executing a

4 manipulation operation for said row includes assigning ownership of said first entry  
5 and said second entry to said first subtransaction.

1 7. The method of Claim 1, wherein said particular logical storage unit includes a data  
2 block in said database system.

1 8. A method of inserting rows into logical storage units that store information in a  
2 database system, the method comprising the steps of:

3 inserting a first row piece of a spanning row into a first logical storage unit;  
4 prior to inserting a second row piece of said spanning row into a second logical  
5 storage unit, determining whether one or more criteria is satisfied, wherein  
6 said one or more criteria include that said second logical storage unit has  
7 enough space allocated to identify at least a threshold number of interested  
8 transactions; and

9 inserting said second row piece of said spanning row into said second logical storage  
10 unit only when said one or more criteria are satisfied.

1 9. The method of Claim 8, wherein a data structure in each logical storage unit of said  
2 logical storage units is used to identify interested transactions for said each logical  
3 storage unit.

1 10. The method of Claim 9, wherein said data structure is a transaction list with entries,  
2 wherein each entry of said entries may be owned by an interested transaction.

1 11. The method of Claim 8, wherein said one or more criteria include that said second  
2 row piece be the second or greater row piece in said spanning row.

1       12. The method of Claim 8, wherein said threshold number is greater than the sum of the  
2                  quantity of overflow row pieces stored in said second logical storage unit after  
3                  inserting said second row piece.

1       13. A computer-readable medium carrying one or more sequences of instructions for  
2                  modifying data in a database system, wherein execution of the one or more sequences  
3                  of instructions by one or more processors causes the one or more processors to

4                  perform the steps of:

5                  constructing work granules that manipulate rows in a manner that groups the rows

6                  within said work granules according logical storage units that contain the  
7                  rows; and

8                  during execution by an entity of a particular work granule that involves manipulation

9                  operations for rows in a particular logical storage unit:

10                 causing said entity to perform said manipulation operations for rows

11                 completely contained in said logical storage unit;

12                 determining a set of spanning rows that are partially contained in said logical  
13                 storage unit and that satisfy a particular condition; and

14                 causing said entity to perform said manipulation operations for all pieces of all  
15                 spanning rows in said set of spanning rows.

1       14. The computer-readable media of Claim 13, wherein said particular condition is that  
2                  each spanning row in said set start in said logical storage unit.

1       15. The computer-readable media of Claim 13, wherein:

2                  said work granules include:

3                  a first work granule that involves manipulation operations for a first logical  
4                 storage unit that includes a portion of a row, and

5           a second work granule that involves manipulation operations for a second  
6           logical storage unit that also includes another portion of said row;  
7           the computer-readable media further includes instructions for performing:  
8               during execution of said first work granule,  
9                   determining that said row satisfies said particular condition, and  
10                  in response to determining that said row satisfies said particular  
11                  condition, performing a manipulation operation for said row;  
12                  and  
13                during execution of said second work granule,  
14                   determining that said row does not satisfy said particular condition,  
15                  and  
16                  in response to determining that said row does not satisfy said particular  
17                  condition, foregoing any manipulation operation for said row.

- 1       16. The computer-readable media of Claim 13, wherein said work granules are executed  
2           as part of a transaction that includes a first subtransaction and a second  
3           subtransaction, wherein a first work granule is executed as part of said first  
4           subtransaction and a second work granule is executed as part of said second  
5           subtransaction.

- 1       17. The computer-readable media of Claim 16, wherein  
2           said first work granule involves manipulation operations for a first logical storage unit  
3           that includes a portion of a row;  
4           said second work granule involves manipulation operations for a second logical  
5           storage unit that also includes another portion of said row; and

6           the computer-readable media further includes instructions for executing a  
7           manipulation operation for said row as part of said first subtransaction.

1       18. The computer-readable media of Claim 17, wherein said first logical storage unit  
2       contains a first transaction list with a first entry, wherein said second logical storage  
3       unit contains a second transaction list with a second entry, wherein said step of  
4       executing a manipulation operation for said row includes assigning ownership of said  
5       first entry and said second entry to said first subtransaction.

1       19. The computer-readable media of Claim 13, wherein said particular logical storage  
2       unit includes a data block in said database system.

1       20. A computer-readable medium carrying one or more sequences of instructions for  
2       inserting rows into logical storage units that store information in a database system,  
3       wherein execution of the one or more sequences of instructions by one or more  
4       processors causes the one or more processors to perform the steps of:  
5       inserting a first row piece of a spanning row into a first logical storage unit;  
6       prior to inserting a second row piece of said spanning row into a second logical  
7       storage unit, determining whether one or more criteria is satisfied, wherein  
8       said one or more criteria include that said second logical storage unit has  
9       enough space allocated to identify at least a threshold number of interested  
10      transactions; and

11      inserting said second row piece of said spanning row into said second logical storage  
12      unit only when said one or more criteria are satisfied.

- 1    21. The computer-readable media of Claim 20, wherein a data structure in each logical  
2    storage unit of said logical storage units is used to identify interested transactions for  
3    said each logical storage unit.
- 1    22. The computer-readable media of Claim 21, wherein said data structure is a  
2    transaction list with entries, wherein each entry of said entries may be owned by an  
3    interested transaction.
- 1    23. The computer-readable media of Claim 20, wherein said one or more criteria include  
2    that said second row piece be the second or greater row piece in said spanning row.
- 1    24. The computer-readable media of Claim 20, wherein said threshold number is greater  
2    than the sum of the quantity of overflow row pieces stored in said second logical  
3    storage unit after inserting said second row piece.